LATEX MODIFIED CONCRETE OVERLAY
September 30, 1996

General Requirements

1.01 Description

A. The Contractor shall furnish material for and install the concrete overlay as shown in the Plans. The concrete shall be produced and installed in accordance with this Special Provision.

1.02 Quality Assurance

A. The Engineer will perform operational control testing as the concrete is being placed. The Contractor shall provide the Engineer with a 0.2 cubic meter container and assistance in obtaining and handling samples. The 0.2 cubic meter container shall have a 250 millimeter minimum depth and shall be placed on a level surface. A minimum of one test per mobile mixer per shift will be conducted. The test will be conducted after eight minutes of mixer operation.

B. The Engineer will perform slump and air tests as the concrete is being placed. The minimum number of tests will be one slump test and one air test per mobile mixer, beginning with the first charge and every other charge thereafter. The sample will be taken after the first two minutes of continuous mixer operation. The concrete will be sampled as follows:

1. While concrete is being deposited onto the bridge deck, the stream will be diverted into a wheelbarrow or other suitable container. Approximately 0.03 cubic meter of concrete will be sufficient to conduct one slump test and one air test.

2. Take the sample to the test site. The test site should be located away from the mobile mixer and off the end of the bridge if practical.

3. Allow the sample to stand undisturbed. The fresh concrete sample must be protected from sunlight and wind until the conclusion of the testing. Total time from discharge to time of start of slump testing will not exceed six and onehalf minutes.

The test for determining the slump of the concrete will be conducted in accordance with WSDOT test Method 804 and the test for determining the percentage of entrained air will be conducted in accordance with WSDOT test Method 805.

C. During the initial proportioning, mixing, placing, and finishing operations, the Engineer may require the presence of a technical representative from the latex admixture manufacturer. The technical representative shall be capable of performing, demonstrating, inspecting, and testing all of the functions required for placement of the latex modified concrete as specified in this Special Provision and as approved by the Engineer. This technical representative shall aid in the proper installation of the latex modified concrete. Recommendations made by the technical representative on or off the jobsite, and approved by the Engineer, shall be adhered to by the Contractor, at the Contractor's expense. The Engineer will advise the

Contractor in writing a minimum of five working days before such services are required.

1.03 Submittals

A. The Contractor shall submit the proposed mix design for review, and samples of the latex and Portland cement for testing and compatibility approval, prior to the date of overlay placement. Concrete placement shall not begin until written approval from the Engineer has been received. The mix design shall be in accordance with Section 2.02, Proportioning Materials, of this Special Provision.

1.04 Storing And Handling

A. Storing and handling materials shall be in accordance with the Standard Specifications and the following:

1. Aggregate
The moisture content of the aggregate at the time of proportioning shall be as specified in section 2.01 of this Special Provision. Aggregates shall be stored and handled in a manner to prevent variations of more than 1.0 percent in moisture content of the stockpile.

2. Latex Admixture
The admixture shall be kept in suitable containers which will protect it from freezing and from exposure to temperatures in excess of 29 degrees C. Containers of the admixture shall not be stored in direct sunlight for periods in excess of ten days. When stored in direct sunlight the top and sides of the containers shall be covered with insulating blanket material.

Storage of the admixture may extend over a period greater than ten days as long as the above specified conditions are maintained and the latex admixture is agitated or stirred once every ten days. Stirring or agitation of the admixture shall be done mechanically in accordance with the manufacturer's recommendation and as approved by the Engineer. If the ambient temperature is higher than 29 degrees C at any time during the storage period, the admixture shall be covered by insulated blankets or other means that will maintain the admixture temperature below the 29 degree limit.

The admixture shall be strained through a 2.00 millimeter strainer at the time it is introduced into the mixing tank from the storage containers.

3. High Molecular Mass Methacrylate Resin (HMMM)
The HMMM shall be stored in a cool dry place and protected from freezing and exposure to temperature in excess of 38 degrees C. The promoter and initiator, if supplied separate from the resin, shall not contact each other directly. Containers of promoters and initiators shall not be stored together in a manner that will allow leakage or spillage from one to contact the containers or material of the other.

Material Specifications

2.01 General

A. All material shall meet the requirements of Sections 9-01 and 9-03 of the Standard Specifications and the following:

1. Portland Cement
Type III cement is not permitted.

2. Coarse Aggregate
Coarse aggregate shall meet the requirements of Section 9-03.1(3) Grading No. 6.

The moisture content of the coarse aggregate shall be no more than 1 percent over saturated surface dry condition.

3. Fine Aggregate
Fine aggregate shall meet the requirements of Section 9-03.1(2) Class 1.

The moisture content of the fine aggregate shall be no more than 3.0 percent over saturated surface dry condition.

4. Sand For Abrasive Finish
Sand for abrasive finish shall be crushed sand, oven dried, and stored in moisture proof bags. The sand shall meet the following gradation requirements:

Sieve Size	Percent Passing	
	Min.	Max.
2.36 mm	100	
0.600 mm	97	100

All percentages are by mass.

5. Latex Admixture
The latex admixture shall be a nontoxic, film-forming, polymeric emulsion in water to which all stabilizers have been added at the point of manufacture. It shall be homogeneous and uniform in composition and shall meet the following requirements:

Polymer Type	Styrene Butadiene
Stabilizers:	
Latex	Non-ionic surfactants
Portland Cement	Polydimethyl siloxane
Percent Solids	46.0 to 49.0
Mass per Liter	1 kg @ 25° C
Color	White
pH (as shipped)	9 min.
Freeze/Thaw Stability	5 cycles (-15° C to 25° C)
Shelf Life	2 year min.

The Contractor shall submit to the Engineer a manufacturer's certification ensuring that the product meets the specifications.

6. High Molecular Mass Methacrylate Resin (HMMM)
The HMMM resin for crack and joint sealing shall conform to the following:

Viscosity	>25 cps (Brookfield RVT w/ UL adaptor, 50 RPM at 25°C)... CA. Test 434

Density	3.9 to 4.0 kg/L at 25°C... ASTM D 2849
Flash Point	>93°C PMCC (Pinsky-Martens CC)
Vapor Pressure	<1.0 mm Hg at 25°C ASTM D 323
Tg (DSC)	>58°C ASTM D 3418
Gel. Time	60 Minutes Minimum

The promoter/initiator system for the methacrylate resin shall consist of a metal drier and peroxide.

2.02 Proportioning Materials

A. The concrete shall be a workable mix, uniform in composition and consistency, conforming to the following design:

Portland cement (parts by mass)	1.00	
Fine aggregate (parts by mass)	2.40-2.75	
Coarse aggregate (parts by mass)	1.75-2.00	
Latex admixture (L/kg)	.31	
Air content of plastic mix (%)	6.00	max.
Maximum water/cement ratio	0.33	

The water limit for calculating the water/cement ratio shall include the added water, the free water in the aggregates, and 52 percent of the latex admixture.

B. The concrete shall have a maximum slump of 180 millimeters. The Contractor is responsible for adjusting the slump to accommodate the gradient of the deck.

C. The aggregates shall be proportioned so that the amount of aggregate passing the 4.75 millimeter sieve is 65 $\pm$ 5 percent of the total aggregate (fine plus coarse). All calculations are based on dry mass.

Equipment

3.01 Rotary Mill

A. Rotary milling machines shall be capable of scarifying a minimum width of 1.2 meters per pass. Machines known to have the specified capacity are the CMI Roto-Mill PR-225 or larger, the Gomaco ScaraPlane, and the Barber Green RX-40 or larger.

B. Rotary milling machines shall conform to the provisions of Section 1-07.7. The Contractor shall submit to the Engineer the axle loads and spacings of the machine to be used at least 15 working days prior to the beginning of scarifying. Scarifying shall not begin until the Contractor has received written approval of the machine to be used from the Engineer.

3.02 Hydro Demolisher

A. Scarifying shall not begin until the Contractor has received written approval of the hydro demolishing machine to be used from the Engineer.

1. All water used in the hydro demolisher scarifying process shall be potable. Stream or lake water will not be permitted.

2. All bridge drains and other outlets within 30 meters of the hydro demolishing machine shall be temporarily plugged during the scarifying operation. The Contractor shall furnish the Engineer a Plan outlining the methods by which excess runoff water and contaminants will be controlled.

3.03 Air Compressor

A. Air compressors shall be equipped with oil traps to eliminate oil from being blown onto the roadway deck during sandblasting and air-cleaning.

3.04 Vacuum Machine

A. Vacuum machines shall be capable of collecting all dust, concrete chips, free standing water and other debris encountered while cleaning during deck preparation. The machines shall be equipped with collection systems that will allow the machines to be operated in air pollution sensitive areas and shall be equipped to not contaminate the deck during final preparation for concrete placement.

3.05 Water Spraying System

A. The water spraying system shall include a portable high pressure sprayer with a separate water supply. The sprayer must be readily available to all parts of the deck being overlaid and must be able to discharge water in a fine mist to prevent accumulation of free water on the deck. Sufficient water must be available to thoroughly soak the deck being overlaid and to keep the deck wet prior to concrete placement.

B. The Contractor shall certify that the water spraying system meets the following requirements:

Pressure	15.2 MPa minimum
Flow Rate	17 L/min. or 0.00028 m^3/second minimum
Fan Tip	15° to 25° Range

3.06 Mobile Mixer

A. Proportioning and mixing shall be accomplished in self-contained, self-propelled, continuous-mixing units conforming to the following requirements:

1. The mixer shall be equipped so that it can be grounded.

2. The mixer shall be equipped to provide positive measurement of the portland cement being introduced into the mix. An approved recording

meter, visible at all times and equipped with a ticket print-out, shall be used.

3. The mixer shall be equipped to provide positive control of the flow of water and latex admixture into the mixing chamber. Water flow shall be indicated by an approved flow meter with a minimum readability of 1.9 liters per minute, accurate to ± 1 percent. The water system shall have a bypass valve capable of completely diverting the flow of water. Latex flow shall also be indicated by an approved flow meter with a minimum readibility of 7.6 liters per minute, accurate to ± 1 percent. The latex system shall be equipped with a bypass valve suitable for obtaining a calibrated sample of admixture.

4. The mixer shall be equipped to be calibrated to automatically proportion and blend all components of the specified mix on a continuous or intermittent basis as required by the finishing operation, and shall discharge mixed material through a conventional chute directly in front of the finishing machine.

B. Inspection of each mobile mixer shall be done by the Contractor in the presence of the Engineer and in accordance with the following requirements:

1. Check the manufacturer's inspection plate or mix setting chart for the serial number, the proper operating revolutions per minute (rpm), and the approximate number of counts on the cement meter to deliver 42.64 kilograms of cement.

2. Make a general inspection of the mobile mixer to ensure cleanliness and good maintenance practices.

3. Check to see that the aggregate bins are empty and clean and that the bin vibrators work.

4. Verify that the cement aeration system operates, that the vent is open, and that the mixer is equipped with a grounding strap. Check the cement meter feeder to ensure that all fins and pockets are clean and free from accumulated cement. If the operator cannot demonstrate, through visual inspection, that the cement meter feeder is clean, all cement shall be removed from the bin and the cement meter feeder inspected. The aeration system shall be equipped with a gauge or indicator to verify that the system is operating.

5. Verify that the main belt is clean and free of any accumulated material.

6. Check the latex strainer to ensure cleanliness.

C. Calibration

The initial calibration shall consist of the following items:

1. Cement Meter
   a. Refer to the truck manufacturer's mix setting chart to determine the specified operating rpm and the approximate number of counts required on the cement meter to deliver 42.64 milograms of cement.

b. Place at least 40 bags (about 1800 kilograms) of cement in the cement bin.

c. Be sure the mixer is resting on a level surface.

d. Be sure the mixer is grounded.

e. Adjust the engine throttle to obtain the specified rpm. Operate the unit, discharging cement until the belt has made one complete revolution. Stop the belt. Reset the cement meter to zero. Position a suitable container to catch the cement and discharge approximately one bag of cement. With a stop watch, measure the time required to discharge the cement. Record the number of counts on the cement meter and determine the mass of the cement in the container. Repeat the process of discharging approximately one bag of cement until six runs have been made. Reset the cement meter to zero for each run.

Example:

Run No.	Cement Counts	Mass of Cement (kg)	Time In Seconds
1	66	43.09	31
2	68	43.54	31.2
3	67	43.32	31.0
4	66	43.09	29.8
5	67	43.20	30.5
6	66	43.09	30.8
TOTAL	400	259.33	184.3

Pounds of cement per count on cement meter:

$$\frac{\text{Mass of Cement}}{\text{No. of Counts}} = \frac{259.33}{400} = \frac{0.65 \text{ kg}}{\text{Count}}$$

Counts per bag (42.64 kilograms):

$$\frac{42.64}{0.65} = 65.6 \ \frac{\text{Counts}}{\text{Bag}}$$

Pounds of cement discharged per second:

$$\frac{\text{Mass of Cement}}{\text{Time in Seconds}} = \frac{259.33}{184.3} = 1.41 \ \frac{\text{kg}}{\text{SEC.}}$$

Required time to discharge one bag:

$$\text{Time} = \frac{42.64}{1.41} = 30.24 \ \frac{\text{SEC.}}{\text{Bag}}$$

2. Latex Throttling Valve

a. Check to be sure that the latex strainer is unobstructed.

b. The latex throttling valve must be adjusted to deliver 13.25 liters of latex for each bag of cement. From the above calculation 30.24 seconds are required to deliver one bag of cement.

c. With the unit operating at the specified rpm, discharge latex into a container for 30.24 seconds and determine the mass of latex. Continue adjusting the valve until 13.33 kilograms of latex is discharged in 30.24 seconds. Verify the accuracy of this valve setting three times.

3. Water Flow Meter

a. Set the water flow meter by adjusting it to flow at 1.9 liters per minute.

b. Collect and weigh the water discharged during a one minute interval with the equipment operating at the specified rpm. Divide the mass of water by 1 to determine the number of liters.

c. Repeat Items a. and b., above, with the flow meter adjusted to 5.7 liters per minute.

4. Aggregate Bin Gates

a. Set the gate openings to provide the amount of aggregate required to produce concrete having the specified proportions.

b. Discharge a representative sample of the aggregates through the gates and separate on the 4.75 millimeter sieve. Aggregates shall meet the requirements for proportions in accordance with section 2.02C of this Special Provision.

c. Adjust the gate openings if necessary to provide the proper ratio of fine aggregate to total aggregate.

5. Production of Trial Mix

Each mobile mixer shall be operated to produce at least 0.5 cubic meter of concrete, which shall be in compliance with these specifications, prior to acceptance of the mobile mixer for job use. The Engineer will perform yield, slump, and air tests on the concrete produced by each mixer.

D. Calibration of each mobile mixer shall be done by the Contractor in the presence of the Engineer. A complete calibration is required on each mixer on each pour unless, after the initial calibration, the personnel having the responsibility of mixer calibration on subsequent pours were present during the initial calibration of the mixer and during the pouring operations and are able to verify the dial settings of the initial calibration and pours.

If these criteria are met, a complete calibration need not be repeated provided that a single trial run verifies the previous settings of the cement meter, latex throttling valve, water flow meter, and aggregate gradations, and that the mixer has not left the project and the Engineer is satisfied that a complete calibration is not needed.

3.07 Finishing Machine

A. The finishing machine shall meet the requirements of Section 6-02.3(10) and the following requirements:

1. The finishing machine shall be self-propelled and be capable of forward and reverse movement under positive control. Provisions shall be made for the raising and lowering of all screeds under positive control. The upper vertical limit of screed travel shall permit the screed to clear the finished concrete surface.

2. The finishing machine shall have the necessary adjustments to produce the required cross-section, line, and grade. When placing concrete in a lane or strip abutting a previously placed lane or strip, the side of the finishing machine adjacent to the completed lane or strip shall be equipped to travel on the completed lane or strip.

3. The finishing machine shall be equipped with a rotating cylindrical double drum screed not exceeding 1.525 meters in length preceded by a vibrating pan. The vibrating pan shall be constructed of metal and be of sufficient length and width to properly consolidate the mixture. The vibrating frequency of the vibrating pan shall be variable with positive control between 3,000 and 6,000 rpm. A machine with a vibrating pan as an integral part may be proposed and will be considered for approval by the Engineer. Other finishing machines will be allowed subject to approval of the Engineer.

Construction Requirements

4.01 Deck Preparation

A. The entire roadway surface of the deck shall be scarified to remove the surface matrix of the concrete. Power operated rotary milling machines or hydro demolishing machines shall be used. Areas that are inaccessible to these machines shall be hand-chipped to the same depth.

The Contractor shall not scarify the roadway surface of the deck unless completion of the overlay can be accomplished within the current construction season.

All reinforcing steel damaged due to the Contractor's operations shall be repaired by the Contractor. For bridge decks existing prior to this contract, damage to existing reinforcing steel shall be repaired by the Contractor and paid for in accordance with Section 1-09.6 if the existing concrete cover is 13 millimeters or less. All other reinforcing steel damaged due to the Contractor's operations shall be repaired by the Contractor at no cost to the State. The repair shall be as follows or as directed by the Engineer.

1. Damage to epoxy coating shall be repaired in accordance with Section 6-02.3(24)H.

2. Damage to bars resulting in a section loss of 20 percent or more of the bar area shall be repaired by chipping out the adjacent concrete and splicing a new bar of the same size. Concrete shall be removed to provide a 20 millimeter minimum clearance around the bars. The splice bars shall extend a minimum of 0.75 meters beyond each end of the

damage. Patching concrete shall be placed in accordance with Section 3.03 of the Special Provision titled **FURTHER DECK PREPARATION**.

3. Any bars partially or completely removed from the deck shall have the damaged portions removed and spliced with new bars as outlined in Item 2 above.

B. After scarifying is completed, the lane or strip being overlaid shall be thoroughly cleaned of all dust, free standing water, and loose particles. Cleaning may be accomplished by using compressed air, water blasting with a minimum pressure of 35 megapascals, or vacuum machines. Vacuum cleaning shall be used when required by applicable air pollution ordinances.

C. Once the lane or strip being overlaid has been cleaned of debris from scarifying, the Contractor under the direction of the Engineer, shall perform an inspection and shall mark those areas of the existing bridge deck that require further deck preparation by the Contractor. Further deck preparation will be required when any one of the following conditions is present:

1. Unsound concrete.

2. Lack of bond between existing concrete and reinforcing steel.

3. Exposure of reinforcing steel to a depth of one-half of the periphery of a bar for a distance of 300 millimeters or more along the bar.

D. If further deck preparation is necessary, it shall be done in accordance with the Special Provision titled **FURTHER DECK PREPARATION**. If the overlay is placed on a bridge deck constructed as part of this project, all work associated with **FURTHER DECK PREPARATION** shall be at the Contractor's expense.

E. The entire lane or strip being overlaid shall then be sandblasted or shotblasted, using equipment approved by the Engineer, until sound concrete is exposed. Care shall be taken to ensure that all exposed reinforcing steel and the surrounding concrete is completely blasted. Bridge grate inlets, expansion dams, and barriers above the surface to be blasted shall be protected from the blasting.

F. The final surface of the deck shall be free from oil and grease, rust, and other foreign material that may reduce the bond of the new concrete to the old. These materials shall be removed by detergent-cleaning or other method as approved by the Engineer followed by sandblasting.

G. After all scarifying, chipping, sandblasting, shotblasting, and cleaning is completed, the entire lane or strip to be overlaid shall be cleaned in final preparation for placing concrete using either compressed air or vacuum machines. Vacuum machines shall be used when warranted by applicable air pollution ordinances.

H. Scarifying with rotary milling machines, chipping, sandblasting, shotblasting, and cleaning in areas adjacent to a lane or strip being cleaned in final preparation for placing concrete shall be discontinued when final preparation is begun. Scarifying and chipping shall remain suspended until the concrete

has been placed and the requirement for curing time has been satisfied. Sandblasting, shotblasting, and cleaning shall remain suspended for the first 24 hours of curing time after the completion of concrete placing.

If the hydro demolishing scarification process is used, scarification may proceed during the final cleaning and overlay placement phases of the work on adjacent portions of the structure so long as the hydro demolisher operations are confined to areas which are a minimum of 30 meters away from the defined limits of the final cleaning or overlay placement in progress. If the hydro demolisher impedes or interferes in any way with the final cleaning or overlay placement as determined by the Engineer, the hydro demolishing work shall be terminated immediately and the hydro demolishing equipment removed sufficiently away from the area being prepared or overlaid to eliminate the conflict. If the grade is such that water and contaminants from the hydro demolishing operation will flow into the area being prepared or overlaid, the hydro demolishing operation shall be terminated and shall remain suspended for the first 24 hours of curing time after the completion of concrete placement.

I. If, after final cleaning, the lane or strip being overlaid becomes wet, the Contractor shall flush the surface with high pressure water, prior to placement of the overlay. All free standing water shall be removed prior to concrete placement. Concrete placement shall begin within 24 hours of the completion of deck preparation for the portion of the deck to be overlaid. If concrete placement has not begun within 24 hours, the lane or strip being overlaid shall be cleaned by a light sand blasting followed by washing with the high pressure water spray, or by cleaning with the high pressure spray as approved by the Engineer.

J. Traffic other than required construction equipment will not be permitted on any portion of the lane or strip being overlaid that has undergone final preparation for placing concrete unless approved by the Engineer. Areas of the prepared lane or strip that must have construction equipment traffic shall be covered with polyethylene sheeting to prevent contamination.

4.02 Mixing Concrete

A. The equipment used for mixing the concrete shall be operated with strict adherence to the procedures set forth by its manufacturer.

B. A minimum of two mixers will be required at the overlay site for each pour when the total volume of concrete to be placed during the pour exceeds the material storage capacity of a single mixer. Additional mixers may be required if conditions require that material be stockpiled away from the jobsite. The Contractor shall have sufficient mixers on hand to ensure a consistent and continuous delivery and placement of concrete throughout the pour.

Charging the mobile mixer shall be done in the presence of the Engineer. Mixing capabilities shall be such that the finishing operation can proceed at a steady pace.

4.03 Overlay Thickness

A. The overlay shall have a thickness of 38 millimeters. The thickness shall be verified prior to the placement of concrete by attaching a filler block, having a

thickness of 6 millimeters less than the overlay thickness, to the bottom of the screed. The filler block shall pass freely over the surface to be overlayed. With the screed guides in place, the finishing machine shall be passed over the entire surface to be overlaid and the final screed rail adjustments shall be made.

B. If the overlay thickness does not verify, the profile of the new concrete surface shall be adjusted as approved by the Engineer.

C. After the overlay thickness has been verified, changes in the finishing machine elevation controls will not be allowed.

4.04 Installing And Removing Screed Rails

A. Rails upon which the finishing machine travels shall be placed outside of the area to be overlaid. Interlocking rail sections or other approved methods of providing rail continuity are required. Plans for anchoring rails shall be submitted, in accordance with Section 1-05.3, to the Engineer for approval.

B. Hold-down devices shot into the concrete are not permitted unless the concrete is to be subsequently overlaid. Hold-down devices of other types leaving holes in the exposed area will be allowed provided the holes are subsequently filled with a sand/cement grout (sand and portland cement in equal proportions by volume). Hold-down devices shall not penetrate the existing deck by more than 20 millimeters.

C. Rails may be removed at any time after the concrete has taken an initial set. Adequate precautions shall be taken during the removal of the finishing machine and rails to protect the edges of the new surfaces.

D. The Contractor shall be responsible for setting screed control to obtain the nominal overlay thickness specified as well as the finished surface smoothness requirements.

4.05 Placing Concrete

A. Prior to concrete placement, the Contractor shall review the equipment, procedures, personnel, and previous results with the Engineer. Inspection procedures shall also be reviewed to ensure coordination.

B. Concrete placement shall be made in accordance with Section 6-02 and the following requirements:

1. After the lane or strip to be overlaid has been prepared and immediately before placing the concrete, it shall be thoroughly soaked and kept continuously wet with water for a minimum period of six hours prior to placement of the concrete. All free standing water shall be removed prior to concrete placement. During concrete placement, the lane or strip shall be kept moist.

   The concrete shall then be promptly and continuously delivered and deposited on the placement side of the finishing machine where it shall be thoroughly brushed into the surface and then brought up to final grade. Care shall be exercised to ensure that the surface receives a thorough, even coating and that the rate of progress is limited so that the

brushed concrete does not become dry before it is covered with additional concrete as required for the final grade. All aggregate which is segregated from the mix during the brushing operation shall be removed from the deck and disposed of by the Contractor.

When concrete is to be placed against the concrete in a previously placed transverse joint, lane, or strip, the previously placed concrete shall be sawed back 150 millimeters to straight and vertical edges and shall be sandblasted or water blasted before new concrete is placed. The Engineer may decrease the 150 millimeter saw back requirement to 50 millimeters minimum, if a bulkhead was used during previous concrete placement and the concrete was hand vibrated along the bulkhead.

2. Concrete placement shall not begin if rain is expected. Adequate precautions shall be taken to protect freshly placed concrete in the event that rain begins during placement. Concrete that is damaged by rain shall be removed and replaced by the Contractor at the Contractor's expense, and to the satisfaction of the Engineer.

3. Concrete shall not be placed when the temperature of the concrete surface is less than 7 degrees C or greater than 24 degrees C, when the combination of air temperature, relative humidity, fresh concrete temperature, and wind velocity at the construction site produces an evaporation rate of 7.2 pascals of surface per hour as determined from Table 6-02.3(6)-1, or when winds are in excess of 4.5 meters per second. If the Contractor elects to work at night to meet these criteria, adequate lighting shall be provided at the Contractor's expense and as approved by the Engineer.

4. If concrete placement is stopped for a period of one-half hour or more, the Contractor shall install a bulkhead transverse to the direction of placement at a position where the overlay can be finished full width up to the bulkhead. The bulkhead shall be full depth of the overlay and shall be installed to grade. The concrete shall be finished and cured in accordance with these specifications.

   Further placement is permitted only after a period of 12 hours unless a gap is left in the lane or strip. The gap shall be of sufficient width for the finishing machine to clear the transverse bulkhead installed where concrete placement was stopped. The previously poured concrete shall be sawed back from the bulkhead, to a point designated by the Engineer, to straight and vertical edges and shall be sandblasted or water blasted before new concrete is placed.

5. Concrete shall not be placed against the edge of an adjacent lane or strip that is less than 36 hours old.

4.06 Finishing Concrete

A. Finishing shall be accomplished in accordance with the applicable portions of Section 6-02.3(10) and these Special Provisions. Concrete shall be placed and struck-off approximately 13 millimeters above final grade and then consolidated and finished to final grade with a single pass (the Engineer may require additional passes) of the finishing machine. Hand finishing may be necessary to close up or seal off the surface. The final product shall be a

dense uniform surface. Latex shall not be sprayed on the freshly placed concrete surface; however, a light fog spray of water is permitted if required for finishing, as determined by the Engineer.

B. As the finishing machine progresses along the pour, the surface shall be given a final finish by texturing with a comb perpendicular to the center line of the bridge. The texture shall be applied immediately behind the finishing machine. The comb shall consist of a single row of metal tines capable of producing 3 millimeter wide striations approximately 4.5 millimeters in depth at approximately 13 millimeter spacing. The combs may be operated manually or mechanically, either singly or in gangs (several combs placed end to end). This operation shall be done in a manner that will minimize the displacement of the aggregate particles. The texture shall not extend into areas within 0.6 meter of the curb line. The non-textured concrete within 0.6 meter of the curb line shall be hand finished with a steel or magnesium trowel.

C. Screed rails and construction dams shall be separated from the newly placed concrete by passing a pointing trowel along the inside surfaces of the rails or dams. Care shall be exercised to ensure that this trowel cut is made for the entire depth and length of rails or dams after the concrete has stiffened sufficiently that it does not flow back.

D. After the burlap cover has been removed and the concrete surface has dried, but before opening to traffic, all joints and visible cracks shall be filled and sealed with a high molecular mass methacrylate resin (HMMM). Cracks 1.5 millimeters and greater in width shall receive two applications of HMMM. Immediately following the application of HMMM, the wetted surface shall be coated with sand for abrasive finish.

4.07 Curing Concrete

A. As the texturing portion of the finishing operation progresses, the concrete shall be immediately covered with a single layer of clean, new or used, wet burlap. The burlap shall meet the requirements of Section 9-23.5 and shall have a maximum width of 1.83 meters. The Engineer will determine the suitability of the burlap for reuse, based on the cleanliness and absorption ability of the burlap. Care shall be exercised to ensure that the burlap is well drained and laid flat with no wrinkles on the deck surface. Adjacent strips of burlap shall have a minimum overlap of 150 millimeters. Once in place the burlap shall be lightly fog sprayed with water. A separate layer of white, reflective type polyethylene sheeting shall immediately be placed over the wet burlap. The concrete shall then be wet cured by keeping the burlap wet for a minimum of 42 hours after which the polyethylene sheeting and burlap may be removed.

B. Traffic shall not be permitted on the finished concrete until the specified curing time is satisfied and until the concrete has reached a minimum compressive strength of 20 megapascals as verified by rebound number determined in accordance with ASTM C 805.

4.08 Checking for Bond

A. After the requirements for curing have been met, the entire overlaid surface shall be sounded by the Contractor, in a manner approved by and in the

presence of the Engineer, to ensure total bond of the concrete to the bridge deck. Concrete in unbonded areas shall be removed and replaced with latex modified concrete by the Contractor at the Contractor's expense. All cracks, except those that are significant enough to require removal, shall be thoroughly filled and sealed as specified in section 4.06D of this Special Provision.

B. After the curing requirements have been met, the Contractor may use compressed air to accelerate drying of the deck surface for crack identification and sealing.